

**UNIVERSAL TEETH PROSTHESIS AND METHOD OF MANUFACTURE**  
**THEREOF**

5    **FIELD OF THE INVENTION**

        The present invention relates to an improved teeth prosthesis for an upper maxilla or a lower maxilla, and more particularly to a new design of a triple structure teeth prosthesis permitting an improved precision over existing  
10    prostheses. Moreover, as will become apparent hereinafter, the design of the present invention will allow most dental laboratories to use the technology described herein.

15    **BACKGROUND OF THE INVENTION**

        It is well known in the art to provide a teeth prosthesis for a lower or an upper maxilla, the teeth prosthesis being of the type comprising an infrastructure, a suprastructure and means for removable attachment of the suprastructure with  
20    the infrastructure.

        More particularly, US patents 5,429,505 (FORTIN) and 5,674,070 (FORTIN), which is a continuation-in-part of US patent 5,429,505, relate to a teeth prosthesis, a method of manufacture thereof and a method for mounting and removing a suprastructure thereof. These patents disclose a teeth prosthesis for  
25    an upper maxilla including an infrastructure, a suprastructure, and an assembly for removable attachment of the suprastructure with the infrastructure. The infrastructure includes at least three implants, one connection bar, and an assembly for removably fastening the connection bar with and against the head of each of the implants. The suprastructure includes a first member made of cast  
30    metal or alloy having an intrados provided with an opening giving access to a housing of such size and depth to allow the housing of the connection bar therein, a second member permanently attached to the first member, and a set of teeth

fixed to the first member and the second member. The assembly includes two first fastening members, and a second fastening member. The invention is also directed to a method for the manufacture of such a teeth prosthesis.

However, even though aforesaid prior art teeth prosthesis can perform  
5 correctly when installed on the lower or the upper maxilla, the different elements of the teeth prosthesis have to be specifically machined to fit in each user's mouth. This machining involves a very high production cost because each element of the prosthesis must be customised for each user. Moreover, the involved machining procedure is very complicated and it has been demonstrated that the manufacture  
10 of such a teeth prosthesis is extremely difficult from a technical point of view. Furthermore, if a user loses an implant, it is actually quite difficult and expensive to replace it, or even impossible with appropriate precision, since all elements are customised. In most cases, the whole assembly must be replaced.

Therefore, there is a need to provide a teeth prosthesis wherein most of the  
15 elements are not customised, but are standard. This would allow supplying a more accurate teeth prosthesis to the user at an equivalent or cheaper cost. Moreover, this would also allow providing such a new technology available for most dental laboratories. Furthermore, since the elements of the prosthesis are not customised parts, it would be faster and cheaper to repair the teeth prosthesis with the same  
20 precision as the existing prosthesis.

### SUMMARY OF THE INVENTION

25 An object of the present invention is to provide a teeth prosthesis which is more flexible and accessible.

Another object of the present invention is to provide a teeth prosthesis wherein some elements can be replaced with substantially the same precision in case a break occurs.

30 More specifically, the invention relates to a teeth prosthesis for mounting thereon a member having a set of teeth, said teeth prosthesis comprising:

- at least three implants, each implant having opposite ends, one end of each implant being anchored in a bone of a maxilla while an opposite end projects out of a gingiva and defines a head;
- a customized connecting bar being shaped and sized to substantially conform to and face the gingiva and fastened to said implants;
- a pair of mating bars having a predetermined size and shape selected from a plurality of predetermined sizes and shapes, said pair of mating bars comprising a meso-bar fastened to said connecting bar and an iso-bar removably attached to said meso-bar with attaching means, said iso-bar being adapted to receive said member.

The present invention and its advantages will be better understood upon reading of preferred embodiments thereof with reference to appended drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

A detailed description of preferred embodiments will be given herein below with reference to the following drawings, in which like numbers refer to like elements:

Figure 1 is a perspective view of a connecting bar onto which a meso-bar is mounted according to a preferred embodiment of the present invention.

Figure 2 is a perspective view of the connecting bar of Figure 1.

Figure 3 is an exploded perspective view of a meso-bar and an iso-bar of according to a preferred embodiment of the present invention.

Figure 4 is a perspective view of a meso-bar according to a preferred embodiment of the present invention.

Figure 5 is a top perspective view of the iso-bar according to a preferred embodiment of the invention.

Figure 6 is a bottom perspective view of the iso-bar of Figure 5.

## DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

Referring to Figures 1, 2 and 3, there is shown the different elements of a  
5 teeth prosthesis 1 according to the present invention. The teeth prosthesis 1  
comprises at least three implants 2 (as shown in Figure 1) and preferably four to  
six, each implant 2 having opposite ends, one end of each implant being anchored  
in a bone of a maxilla while an opposite end protrudes out of a gingiva and defines  
a head.

10 The teeth prosthesis 1 also comprises a customized connecting bar 4  
shaped and sized to be substantially facing the gingiva and to conform to the  
shape of the gingiva. The connecting bar 4 is fastened to the implants 2 through  
conventional and usual means. As can be appreciated on Figures 1 and 2, the  
connecting bar 4 is a very thin structure which is attachable to the maxilla through  
15 the implants. The connecting bar 4 is preferably provided with an extremely flat top  
part 30 and is preferably shaped and sized to receive components of  
predetermined sizes, as will be explained hereafter.

It should be noted that the connecting bar 4 is fastened to the implants only  
after it has been adjusted to the mouth of the user and to ensure that it is passive,  
20 i.e. that it does not create any pressure or tension on the implants and thus, on the  
maxilla which would otherwise cause pain and discomfort to the patient.

The teeth prosthesis 1 also comprises a pair of mating bars. The mating  
bars have a predetermined shape and size selected from a plurality of  
predetermined shapes and sizes, the purpose of which will be explained  
25 hereinafter. The pair of mating bars includes a meso-bar 6 shaped and sized to  
substantially face the connecting bar 4 and adapted to be fastened thereto and a  
iso-bar 8. The mating bars are removably attached together through attaching  
devices 10 (as shown in Figure 3). Alternatively, one could conceive mating bars  
that do not require attaching devices *per se*, but are so shaped and sized, that  
30 they are held together by friction, for example. Consequently, the term "attaching  
means" includes a friction fit, and other similar ways to attach the bars together.

An element having a set of teeth mounted thereon (not shown) can be mounted onto the triple structure teeth prosthesis 1 as known in the art, and more particularly in US patent 5,674,070.

Referring now to Figures 4 to 7, the meso-bar 6 has substantially the same shape as the connecting bar 4 (as better seen in Figure 1) and comprises a fore part 16 and two opposite rear ends 18, 20. The meso-bar 6 is provided with a set of support points 12 for supporting the iso-bar 8. The iso-bar 8 is also provided with a set of support points 13 (as shown in Figure 11). The support points 12, 13 define an anterior and a posterior support point on each side of the meso-bar 6 and the iso-bar 8. The meso-bar 6 is also provided with a plurality of fixation holes 28 and is rigidly attached onto the connecting bar 4 with at least four fasteners 14, possibly five or six, inserted and secured in the fixation holes 28. For example, screws may be used to do so. If needed, other convenient fixation holes may be drilled in the meso-bar 6.

Referring now to figures 8 to 11, the iso-bar 8 preferably has a shape that is complementary to that of the meso-bar 6, and in fact preferably has a hollow shape, and is provided with a fore part 22 and two opposite rear ends 24, 26. As mentioned previously, the iso-bar 8 is preferably hollow and has a predetermined size and depth to receive the meso-bar 6 therein (as shown in Figure 11).

It is preferred to use the attaching devices 10 for fastening the iso-bar 8 onto the meso-bar 6 shown in Figure 3. However, any other means for removably attaching the meso-bar and the iso-bar together will meet the objects of the present invention and will have no impact on the way the invention works, other than perhaps loss (or increase) of precision. As an example, clips or other types of attaching devices will meet the objects of the invention.

The attaching devices 10 according to a preferred embodiment of the invention are machined for providing a high degree of precision, and a precision of at least 5 microns has been achieved. In the past, such attaching devices were die cast and reached a precision of approximately 50 microns. Preferably, the attaching devices 10 comprise two posterior closure piston systems, well known in the art, but other convenient fasteners may be used. These two attaching devices

10 are respectively attached with a corresponding rear end 24, 26 of the iso-bar 8 for removably attaching them with corresponding ends 18, 20 of the meso-bar 6.

The set of support points 12 of the meso-bar 6 and the set of support points 13 of the iso-bar 8 allow the correct adjustment of both bars together.

5 Preferably, the connecting bar 4 is made of gold or palladium; and the meso-bar 6 and the iso-bar 8 are made of titanium. The attaching devices 10 are also preferably made of palladium, titanium or other appropriate materials.

As mentioned previously, the meso-bar 6 and the iso-bar 8 are standardized in that they are provided in several predetermined sizes, preferably  
10 three, and are not custom made. The connecting bar 4 is the only customized part for correctly adjusting it on the gingiva of the user.

In practice, the implants are fixed to the maxilla and the connecting bar 4 is attached to the implants. A technician then uses a gauge based on the predetermined size and shape of the selected meso-bar 6 to drill the screwing  
15 holes in the connecting bar 4 at locations corresponding to the fixation holes 28 of the meso-bar 6. The flatness of the top part 30 of the connecting bar 4 permits a very accurate adjustment of the gauge thereon.

Then, the meso-bar is fastened to the connecting bar and the iso-bar removably fastened thereto.

20 Consequently, the use of three structures, instead of two as was the case in the past, avoids custom machining of each part of the teeth prosthesis, and allows to greatly increase the accuracy of the positioning of each element regarding the others. More specifically, teeth prostheses of the prior art reach an accuracy of 25 to 50 microns for the positioning of the different elements, while the present  
25 invention reaches at least 5 microns accuracy positioning.

Finally, the use of a three structure prosthesis, standard components and high accuracy renders the technology within the reach of dental laboratories, which was not the case in the prior art, given the exacting nature of custom made components.

In summary, the present invention teaches a first component which is custom-made and fixed to implants, and a pair of components which are manufactured in predetermined sizes to be attached to the custom component.

While embodiments of this invention have been illustrated in the  
5 accompanying drawings and described above, it will be evident to those skilled in  
the art that changes and modifications may be made therein without departing  
from the essence of this invention. All such modifications or variations are believed  
to be within the scope of the invention. Specifically, although bars that fit within  
another are illustrated, any pair of mating bar not designed to fit one within the  
10 other will meet the objects of the invention.

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